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ENTOMOLOGY.

Unusual number of Legs in the Caterpillar of Lagoa.—*Lagoa crispata* Pack. is an interesting moth forming a connecting link between the Dasychiræ (Orgyia) and the Cochlidiæ, represented by Limacodes and its allies. As we remarked in our Synopsis of Bombycidæ (1864): "When we observe the larva we would easily mistake it for a hairy Limacodes larva, for like them the head is retracted, the body is short, and the legs are so rudimentary as to impart a gliding motion to the caterpillar when it moves." After describing the transformations, we added: "There are seven pairs of abdominal or false legs, which are short and thick. The first pair of thoracic or true legs are much shorter than the two succeeding pairs."

Lagoa.

Two years ago we found the fully fed caterpillars and also those before the last molt on scrub-oaks in Providence, and again noticed them while walking, then carefully examined them after placing them in alcohol, and again examined the specimens during the past winter. It is well known that caterpillars have no more than five pairs of "proplegs," "false legs" or abdominal feet, as they are variously called; and so far as we have been able to learn the present caterpillar is the only one which has additional legs, even though rudimentary. As in all lepidopterous larvæ, there are ten abdominal segments. In the larvæ before the last molt there is a pair of rudimentary abdominal legs on the second abdominal segment, forming soft tubercles about one-third as large as the succeeding normal feet; the crown of hooks was wanting, but a tubercle on the anterior side corresponding to a similar one on the normal feet had five or six well marked stout spines, also two or three scattered ones in the middle, the tubercle being rounded, convex, not flattened at the end.

On the sixth segment, following the fourth pair of normal abdominal legs, is a pair of tubercles like those on the second segment and exactly corresponding in situation with the normal legs; situated externally are two long straight spines, but none homologous with those forming the crown. At the base in front of each tubercle is a tuft of sparse hairs, and on the outside is a chitinous spot bearing a dense tuft of hairs; these two tufts precisely agree in situation and appearance with those at the base of normal abdominal legs.

In the fully fed caterpillar the tubercles are exactly the same. It thus appears that in the Lagoa larva the first abdominal segment is footless; the second bears rudimentary feet; segments 3–6 bear normal proplegs; the seventh bears a pair of rudimentary legs; segments eight and nine are footless, while the tenth bears the fully developed anal or fifth pair of genuine proplegs.

While these two pairs of tubercles differ from the normal legs in being much smaller and without a crown of curved spines, they are protruded and actively engaged in locomotion, and in situation, as well as the presence of the basal tufts are truly homologous with the normal abdominal legs.

When we turn to the work of Kowalevsky on the cmbryology of Sphinx, we find that it has ten pairs of abdominal legs which arise in the same manner as the thoracic or chitinous, jointed legs. Of these ten pairs one half disappear before hatching, leaving the five pairs usually present. It seems to us that the two pairs of rudimentary legs in Lagoa are survivals of these embryonic temporary feet. Although the proplegs are not popularly regarded as true legs, they are undoubtedly so, as embryology proves. In the lower Noctuidæ, such as Catocala, Aletia, etc., the larvæ are at first geometriform, having but three pairs of proplegs; in the geometrids there are but two pairs, while in the Cochlidiæ there are not even any rudimentary feet, thoracic or abdominal. As we have elsewhere observed, the primitive lepidopterous larva must have had a pair of feet on each abdominal segment, and may have descended from Neuroptera-like forms allied to the Panorpidæ as well as Trichoptera.—*A. S. Packard.*

USE OF THE PUPÆ OF MOTHS IN DISTINGUISHING SPECIES.—In describing the pupæ of certain moths we have found it well to observe and note with care the shape and appendages of the terminal spine of the abdomen. This has been done to some extent, but our experience teaches us that there are, in a great number of cases, excellent specific or at least generic characters in these parts. In the Bombycidæ, the Notodontians especially, and in the Geometridæ as well as the Phycinæ and Tortricidæ, there are notable differences between those species which do or do not spin a cocoon, the latter attaching themselves by a mass of silk to the leaves, the spines and setæ giving them a firm hold. In those living among leaves or in the earth, the spine is provided with long curved setæ arising from the end and sides of the spines; these vary much, as does the abdominal tip in general in different species of Acrobasis, according as they live simply between leaves or in a cocoon. In some Notodontians which make a cocoon, as in *Lophodonta angulosa*, the tip of the abdomen is blunt, ending in a rounded knob, with no rudiment of a spine.

In *Dalana ministra* the obtuse tip of the abdomen is divided into a stumpy short bifid spine, each division ending in two spines, with an external shorter third minute one at base.

In *Edema albifrons* the tip proper ends in a short spine, which is flattened vertically, deeply cleft, with tubercles, from which arise 3–4 curved setæ on each side, the entire apparatus retaining a firm hold on the end of the mass of silk by which it adheres to the leaves.

In the pupa of *Lochmæus tessella* the tip is flattened vertically and very deeply cleft, each fork ending in a short lateral excurved hook, but with no setæ. This form lives in a slight cocoon, where it has no need of hooks.

In Bombycidæ, such as *Eacles imperialis*, which enters the earth and makes no cocoon, the use of the large caudal spine is as plain as in the pupæ of the Sphinges; so also in the species of Anisota and Dryocampa.

In the Geomtrids and Tortricids there are, in the abdominal spine and hooks, excellent generic and specific characters, as I have found in different species of Teras, etc.—*A. S. Packard.*

SWARMING OF A DUNG-BEETLE, APHODIUS INQUINATUS.—About the first of last October, while riding along a country road near Ripon, my attention was attracted to a dark mass of living matter in the road. On examination it proved to be a host of *Aphodius inquinatus*, engaged with horse dung. They were in two or three masses, whose areas averaged perhaps three square feet each, and were piled up two or three deep. So many, too, were flying about in the air that as I rode along I could, with a single motion of the hand, catch from two or three to half a dozen. Nor were they confined to this one place, for they appeared in considerable numbers at a distance of at least a mile from the point at which I first noticed them.—*C. Dwight Marsh, Ripon, Wis.*

INSECT PESTS ON THE PACIFIC COAST.—California seems to be overrun the present year with insect plagues. Not only are vast swarms of the genuine locust devastating the crops in Placer, Yuba, Navada, Amador, Napa, Sonoma, San Joaquin, Butte, Sacramento, El Dorado, Tehama and Mercer counties, but the wheat fields in Alamada, Napa, Sonoma and Solano counties are being very seriously injured by the Hessian fly, an insect which has hitherto been supposed not to occur on the Pacific coast. Professor Riley, the United States Entomologist, has received specimens, and they prove to be the true Hessian fly.

ENTOMOLOGICAL NOTES.—In Siebold and Kölliker's Zeitschrift, issued May 8th, A. Sommer has an elaborate and well illustrated article on the anatomy and histology of the large common Poduran, *Macrotoma plumbea;* the descriptions, however, do not appear to be comparative. In the same number is an essay, with many illustrations, on the embryology of the mole cricket (Gryllotalpa), by A. Korotneff.——Another paper on the embryology of insects is one by Dr. Tichomirow, on the earlier stages of development of the silk worm *(Bombyx mori).* His observations deal with the process of segmentation, the first development of the heart, and on the occurrence of an inner skeleton in the head of the insect. He then discusses the chemical properties of the eggs. His paper was presented to the Physiological Society of Berlin, and is reported in *Nature* for April 30.——In the *Quarterly Journal of Microscopical Science*, for April, Sidney J. Hickson discusses the eye and optic tract of insects, his observations corroborating the opinion of the majority of previous investigators, that the retinulæ are the true nerve-end cells, while Mr. F. S. Heathcote describes a peculiar sense organ in the Myriopoda, *Scutigera coleoptrata.*——A report on the anatomy of the cotton worm moth (*Aletia xylina*) by C. S. Minot and E. Burgess, extracted from the Fourth Report of the U. S. Entomological Commission, is illustrated by five plates. They describe a membrane on the metathorax of the moth, which they regard as probably homologous with the tympanal membrane or "ear" of the locust (Acrydium).——In Biologisches Centralblatt, Feb. 1, Dr. Dewitz describes the hooked hairs of Chrysopa larvæ, and a male sexual character in Catocala, which consists of a tuft of hairs which lies in a furrow on the middle femora, and which rises like a fan out of the furrow; this has been previously noticed in this country.——In an article on the development of *Sphærularia bombi*, in Zool. Anzeiger for May 11, Professor Leuckart maintains that this parasite of humble bees is nothing else than the female sexual apparatus of a nematoid worm, a kind of transplanted organ which meets with the proper conditions for existence in the body of a foreign host.

ZOOLOGY.

INDESTRUCTIBLE INFUSORIAL LIFE.—J. Hogg describes some further experiments he has made on this subject, supplementing those previously recorded on rotifers. Some Ciliata and Tardigrada have been included, and these have, although not to the same degree, exhibited a remarkable tenacity of life. The intervals of sleep and vigorous life have also been brought into strict accord with the durations of dry and wet periods of the year, so that the subjects of the experiments have been kept in a perfectly dry condition during the whole of the long drought which characterized the past summer.

Moreover, some older dried specimens were subjected to an artificial process of desiccation. They were kept for a time in a hot-air chamber, the heat in which was raised to 2000 F., and subsequently the miniature aquarium in which they were inclosed was plunged into a freezing mixture. Neither process killed them nor greatly diminished their vital powers, their revivification in both cases being somewhat delayed. Certain poisons known to exert a baneful influence over higher animals were added to the water supplied to the rotifers, but in no way did they produce discomfort; on the contrary, portions were taken into the stomach and partly digested. On the other hand, a drop of sewage water caused marked discomfort; they immediately retracted their rotating organs and sank to the bottom of the cell. These were, so far as could be ascertained, poisoned, and this was probable owing to the free sulphide of hydrogen evolved by the putrescent sewage. From